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Publication Number of Utility Model Application:

JP-UM-A-57-124827

Utility Model Application Number Sho-56-009149

Application Date: January 27, 1981

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#### SPECIFICATION

##### 1. Title of the Device:

LIQUID CRYSTAL DISPLAY DEVICE

##### 2. Claims

(1) A liquid crystal display device, comprising: two insulating substrates where a display electrode and a counter electrode are disposed opposite to each other; a lead electrode

conducting with the respective electrodes and drawn out to the end part of at least one insulating substrate; a lead fitting connected to the lead electrode; a conductive agent provided between the lead electrode and the lead fitting; a mold agent wrapping the lead fitting, conductive agent and the end part of the substrate; and liquid crystal sealed between both insulating substrates, wherein the conductive agent is a mixture of an organic adhesive and conductive particles, and has elasticity.

(2) The liquid crystal display device according to claim 1, wherein the organic adhesive is not compatible with the mold agent.

(3) The liquid crystal display device according to claim 1 or 2, wherein the mold agent is mainly composed of an epoxy adhesive, and the organic adhesive is mainly composed of a silicone adhesive.

### 3. Detailed Description of the Invention

This invention relates to a liquid crystal display device and particularly to a lead fitting for an external connecting terminal connected to an electrode, and it is an object of the invention to keep a favorable state without causing a defect in connection even in a long-time use and prevent deterioration of characteristics of the display device.

Fig. 1 shows an example of a liquid crystal display device. Insulating substrates 1, 2 where a display electrode and a

counter electrode are formed respectively are disposed opposite to each other, and liquid crystal is sealed (not shown) between the upper and lower insulating substrates spaced from each other as designated by a spacer. The respective electrodes on the substrate are drawn out to the end part of at least one insulating substrate by a lead electrode, and from the lead electrode, a lead fitting 3 of an external connecting terminal for connection with an external circuit is electrically and mechanically connected. When voltage is applied through the lead fitting to the lead electrode, the voltage is applied between both electrodes to vary electro-optical property of liquid crystal so that a desired display pattern is obtained.

Fig. 2 shows the condition of mounting the lead fitting of this type. That is, the lead fitting 3 has the head part formed like a U-shape to be connected to the lead electrode 4 on the end part of the substrate 2, thereby clamping the end part of the insulating substrate to be connected to each other. Further, for the purpose of supplementing electrical conductivity of the lead electrode and the lead fitting, a conductive agent such as silver-contained epoxy adhesive 5 is used. In order to improve connection and fixing of the lead fitting 3 to the end part of the substrate, mechanical adhesion is increased, and in order to protect a lead fitting connecting part as an electric connecting part from an external atmosphere, it is molded with a mold agent 6 such as epoxy resin.

When the liquid crystal display device is thus formed, fixing of the lead fitting is favorable and electric connection is good. When it is molded with the mold agent to fix the lead fitting, however, the spring property of the connecting part at the tip of the lead fitting is lost. When the display device is used and then a long period of time elapses, the mold agent expands, and especially when moisture is adsorbed from an external atmosphere to the mold agent, the mold agent is swollen to move the lead fitting. The mold agent expands in the direction of the arrow in Fig. 3, for example, so the lead fitting is deteriorated in connection to the lead electrode, to cause imperfect electric connection. Although the conductive agent has been used in order to compensate for such defect, the conventional one is gradually solidified with the passage of time after application and becomes plastic. Consequently, the defect is not caused at the start in the above swelling of the mold agent, but with the passage of time, the conductive agent, as shown in Fig. 4, comes off or cracks so that connecting failure between the lead electrode and the lead fitting is frequently caused.

The invention has been made in the light of such circumstances and it provides a liquid crystal display device in which an external connecting terminal keeps favorable connection with a substrate as designated not to deteriorate characteristics even if a mold agent is swollen after the lapse

of long time.

An embodiment of the invention will now be described with reference to the attached drawings. As shown in Fig. 5, a conductive agent 11 made by mixing a silicone adhesive as a binder with carbon is applied to a part of a substrate 2 to which a lead fitting of a lead electrode 4 is connected, then the lead fitting 3 is mounted, and further molded, covering it with a mold agent formed of an epoxy adhesive 12. The conductive agent 11 is rubber-like and has elasticity, and it is neither solidified with the passage of time nor compatible with the mold agent 12. Accordingly, even if the mold agent is swollen so that the lead fitting is moved to separate from the substrate in a long-time use, the mold agent flows following the movement to gradually enter between the lead fitting and the lead electrode to prevent electric connection failure between the lead fitting and the lead electrode.

The conductive agent thus interposed between the lead fitting and the lead electrode is a mixture of conductive particles such as carbon and an organic adhesive such as a silicone adhesive, and has elasticity. The organic adhesive is not compatible with the mold agent, so that the contact failure between the lead fitting and the lead electrode, which has been caused with the passage of time, can be prevented in the invention. Accordingly, although it has been frequent in the conventional liquid crystal display device that the lead fitting is perfectly

fixed when the device is formed, but with the passage of time, the connection failure between the lead fitting and the lead electrode is caused, the occurrence of such defect can be prevented, deterioration of characteristics can be prevented, and a favorable display pattern as designated can be always obtained in the invention.

Even if a mold agent formed of an acrylic adhesive is used as a mold agent as well as the above, this is not compatible with the above conductive agent, so that even if the mold agent is swollen, the electric connection failure between the lead fitting and the lead electrode can be prevented. It goes without saying that the similar effect can be produced by using not only the above conductive agent and mold agent but also suitable ones according to the gist of the invention, and the thus obtained display device is useful to the industries.

#### 4. Brief Description of the Drawings

Fig. 1 is a perspective view of a liquid crystal display device;

Fig. 2 is a sectional view showing a connecting part of a lead fitting of a liquid crystal display device;

Fig. 3 is a schematic diagram showing the swelling state of a mold agent;

Figs. 4A and 4B are schematic diagrams showing the defective state of a conductive agent; and

Fig. 5 is a sectional view showing the principal part

of one embodiment of the invention.

2: insulating substrate 3: lead fitting of external  
connecting terminal 4: lead electrode 11: conductive agent  
12: mold agent

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⑩ 日本国特許庁 (JP)  
 ⑪ 公開実用新案公報 (U)

⑪実用新案出願公開  
 昭57-124827

⑤Int. Cl.<sup>a</sup>  
 G 02 F 1/133  
 G 09 F 9/00

識別記号  
 111  
 109  
 6865-5C

府内整理番号  
 7348-2H  
 7348-2H

③公開 昭和57年(1982)8月4日  
 審査請求 未請求

(全2頁)

④液晶表示装置

②実願 昭56-9149  
 ②出願 昭56(1981)1月27日  
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⑤実用新案登録請求の範囲

- (1) 互に表示電極と対向電極とが対向して配置される2枚の絶縁基板と、各々の電極に導通し少なくとも一方の絶縁基板の端部に引出されるリード電極と、このリード電極に接続されるリード金具と、前記リード電極とリード金具との間に設けられる導電剤と、前記リード金具、導電剤および基板端部を包むモールド剤と、前記両絶縁基板間に封入される液晶とを具備した液晶表示装置において、前記導電剤は有機接着剤と導電性粒子との混合であつて弾性を有してなることを特徴とする液晶表示装置。
- (2) 有機接着剤はモールド剤と相溶しないことを特徴とする実用新案登録請求の範囲第1項記載の液晶表示装置。

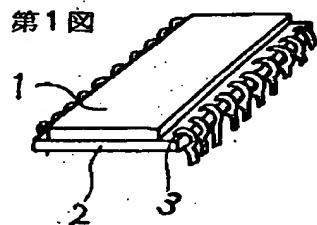
(3) モールド剤はエポキシ系接着剤を主成分とし、有機接着剤はシリコン系接着剤を主成分とすることを特徴とする実用新案登録請求の範囲第1項又は第2項記載の液晶表示装置。

図面の簡単な説明

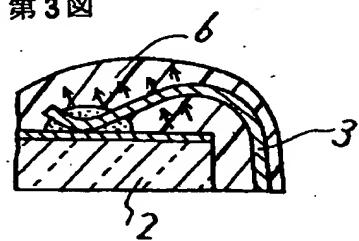
第1図は液晶表示装置の斜視図、第2図は液晶表示装置のリード金具の接続部を示す断面図、第3図はモールド剤の膨潤状態を示す説明図、第4図A、Bは導電剤の不具合状態を示す説明図、第5図は本考案の一実施例の要部を示す断面図である。

2…絶縁基板、3…外部接続端子のリード金具、4…リード電極、11…導電剤、12…モールド剤。

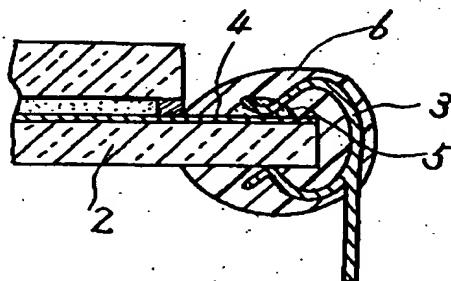
第1図



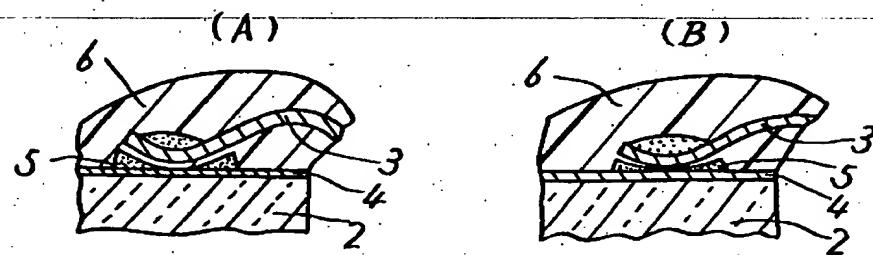
第3図



第2図



第4図



第5図

